

## Some Contributions to the Measurement of Psychopathology

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### INTRODUCTION

This paper presents some of the more important results of a factor analysis of the mental state ratings made as part of the United States-United Kingdom Diagnostic Project's cross-national study. The project was organized in order to help account for the large differences between the two countries in the admission rates for schizophrenia and for the affective disorders (see Kramer, 1969, and Zubin, 1969). The major results of the study have been reported by Cooper, Kendell *et al.* (1969), Gurland *et al.* (1969), Cooper (1970), and Cooper, Kendell, Gurland *et al.* (1972).

An essential part of the research strategy was to have each selected patient administered a structured mental state interview by a project psychiatrist. A factor analysis was applied to the mental state ratings, originally only in order to provide an empirically derived scoring system for the necessary cross-national and intra-national comparisons. Because some of the results of the factor analysis have wider implications for the measurement of psychopathology, we thought it proper to report them in their own right.

### METHODS

The project consisted of two teams of psychiatrists and other social scientists, one based in New York and one in London. Two hundred and fifty consecutive admissions to a New York state mental hospital and 250 consecutive admissions to a London area mental hospital were studied by the project. All patients were aged between 20 and 59 years, but were otherwise unselected from all successive admissions.

A structured mental state interview was used in the study. It consisted of some 400 questions related to current mental state, for each of which one or more items indicating the presence or absence of the psychopathology under examination were recorded. There was a total

of nearly 700 such items, 481 from the Present State Examination (PSE) of Wing *et al.* (1967), and 197 from the Psychiatric Status Schedule (PSS) of Spitzer *et al.* (1970). The mental state interview was administered within 72, and usually within 48 hours of admission. The mental state ratings were made with a high degree of reliability (Kendell *et al.*, 1968), were concurrently valid in that they were strongly associated with the hospital's independent diagnoses in London (although not in New York) (Gurland *et al.*, 1970) and were predictively valid in that they were associated with short-term outcome of hospitalization (Gurland *et al.*, in press).

Each selected patient was given a project diagnosis arrived at by consensus of two or more project psychiatrists after the completion of the mental state interview, plus further interviews with the patient and an informant covering underlying personality and past psychiatric history. The diagnoses were made using the eighth edition of the *International Classification of Diseases*, according to the rules of the United Kingdom *Glossary of Mental Disorders* (General Register Office, 1968). In order to maintain uniformity of rules and procedures by the two teams, there was a frequent interchange of personnel from one side of the Atlantic to the other. Evidence of the success achieved in establishing cross-national comparability is given by Cooper *et al.* (1969) (1972).

In order to provide an empirical identification of the various dimensions of psychopathology measured by the 700 mental state items, a factor analysis was undertaken on the total sample of 500 patients. Since the 700 items were too numerous to be dealt with by available computers, the items were grouped into 185 clusters by consensus of two of the authors (BJG and JEC). The method used for clustering the items was similar to that applied to the

items of the Mental Status Schedule (Spitzer *et al.*, 1967) in that each cluster consisted of items judged clinically to describe similar behaviours or feelings. One of the authors (JEC) was at the same time collaborating in the development of a computer program (CATEGO) designed to produce a diagnosis from the PSE items (Wing, 1970). The clusterings were purposely kept as similar as possible to those employed by CATEGO.

A Varimax factor analysis was applied to the correlations among the 185 clusters of items, and a set of tentative factors extracted. The factor structure was purified by next examining the correlations between each of the individual items and each of the tentative factors. An item was finally assigned to the factor with which it correlated highest, provided that the correlation was at least .45, and provided that the square of that correlation was at least twice the square of the second highest correlation. Twenty-five factors emerged from the analysis. Each was scored simply as the number of its items rated in the direction of pathology. Factor scores were then standardized to have a mean of 50 and a standard deviation of 10 across the entire sample of 500 patients.

#### AN OVERVIEW OF THE RESULTS

In his review of the major factorial analyses of psychopathology, Costello (1970) points out how no two factor analyses have yet yielded identical factors. The results of the factor analysis being reported here are no exception. The names of the twenty-five factors are given in Table I. Each factor either corresponds to one of those cited by Costello as having been found in other studies, or else represents a separation from a larger, more inclusive factor found by others. It is the more important of these latter factors that will be discussed in this paper. The compositions of all the factors, their intercorrelations and reliabilities and their diagnostic discriminabilities are available upon request.

The separations to be described in detail are (a) depression from phobic anxiety, (b) retarded speech and retarded movement from flat affect, and (c) observed restlessness from mania.

TABLE I  
*Twenty-five factors of psychopathology found by U.S.-U.K. diagnostic project*

Depression	Disorientation
Phobic anxiety	Lack of insight
Retarded speech	Depersonalization-derealization
Retarded movement	Paranoid delusions
Reported restlessness	Grandiose delusions
Observed restlessness	Control delusions
Mania	Visual hallucinations
Somatic concerns	Auditory hallucinations
Non-delusional suspiciousness	Bizarre behaviour
Reported belligerence	Non-social speech
Observed belligerence	Flat affect
Obsessions	Incomprehensibility
Self-neglect	

For each of these, the key items contributing to the factors will be given, evidence of inter-rater reliability will be offered, and discriminations between related diagnostic categories afforded by these separations will be described. Stress is placed on diagnostic validity, both because the study from which these data come was essentially a diagnostic one, and because the PSE, which comprises the major portion of the mental state interview used, was intended for diagnostic use.

The intraclass correlation coefficients of inter-rater reliability for the factor scores were calculated on data from three studies of the reliability of the mental state ratings. In one, 37 of the London patients were interviewed by one of the project's psychiatrists, with a second project member sitting in as an observer, making ratings but not asking questions himself. In a second study, 25 of the London patients were re-interviewed within a week of the first interview by a second psychiatrist kept ignorant of the first psychiatrist's ratings. In the third study, 24 of the New York patients had their interviews recorded on audiotape and rated by a psychiatrist different from and ignorant of the ratings made by the interviewer.

In each of the diagnostic comparisons, the diagnoses were those made by consensus of the project's psychiatrists. There is necessarily a strong correlation between a patient's set of factor scores and the consensus diagnosis applied

to him, because the project member who rated the mental state items going into the factors also contributed to the consensus diagnosis. There is some virtue to this correlation, however, for an opportunity is thereby afforded to assess how differences on related dimensions are reflected in differences between related diagnoses.

#### SEPARATION OF DEPRESSION AND PHOBIC ANXIETY

The most striking result of the analysis was the separation into two factors of depression and phobic anxiety. Only Wittenborn (1950, 1963), in a series of factorial analyses of psychopathology, seems also to have been successful in separating these two dimensions. In the analyses of Lorr *et al.* (1962), Cohen *et al.* (1966), and Spitzer *et al.* (1967), depression and anxiety emerged together as single factors. The depression and phobic anxiety factors found in this analysis did, however, correlate highly ( $r = .47$ ).

##### *The depression factor*

Forty-five items were assigned to the depression factor, 29 from the PSE and 16 from the PSS. Some of the items correlating highest with the total factor score were:

- 'Has less interest than usual in things,'
- 'Has difficulty concentrating,'
- 'Admits he is often sad or depressed,'
- 'Has felt life wasn't worth living,' and
- 'Feels overwhelmed with life.'

Other items contributing to the factor were:

- 'Has too little energy,'
- 'Keeps losing his train of thought,'
- 'Has thoughts about killing himself,' and
- 'Diminished appetite.'

Early morning waking, often viewed as a sign of psychotic depression, failed to correlate sufficiently highly with the other items contributing to the depression factor (its correlation with the total factor score was only .23) for it to be included in the scoring of the factor. Klerman (in press) also recently found sleep disturbances, including early morning waking, to load low on a factor for severity of depression. Also absent from the depression factor because

of low correlations with the total factor score were depressive dreams, delusions of guilt, and other depressive delusions and hallucinations. These low correlations may in part be a function of the relative rarity of such reported behaviours. For example, only some two per cent of the sample of 500 reported depressive delusions, and only one per cent reported depressive hallucinations.

##### *The phobic anxiety factor*

Twenty-one items were assigned to the phobic anxiety factor, seventeen from the PSE and four from the PSS. Some of the items correlating highest with the total factor score were:

- 'Presence of situation giving rise to uneasiness or anxiety in the past month,'
- 'Tried to avoid that situation in the past month,'
- 'Trembling; hand shaky; weak at the knees,'
- 'Sweating, clammy hands,' and
- 'Hot and cold feelings, blushing, pallor.'

The phobic anxiety factor was measured, not by general and non-specific feelings of unease or fear, but rather by the presence of specific situations giving rise to anxiety and by physiological concomitants of anxiety. The specific situations described among the twenty-one items were:

- Staying home alone,
- Going out alone,
- Being in an enclosed space, and
- Being in crowds.

The physiological signs of anxiety which contribute to the factor were, in addition to those already cited:

- Butterflies or sinking feeling in stomach,
- Heart pounds or flutters,
- Dry mouth, mouth coated,
- Dizziness, faintness, giddiness, and
- Difficulty in getting breath, choking, tightness in chest.

It is noteworthy that neither of two PSS items describing general feelings of anxiety, 'Admits that he is often anxious' and 'Admits he feels anxious most of the time,' ended up contributing to this factor. In fact, these two items correlated slightly higher with the depression factor (correlations of .48 and .47, respectively) than with the phobic anxiety

factor (correlations of .42 and .36, respectively).

This absence of non-specific anxiety is consistent with the content of other measures of anxiety. For example, of the 50 items in Taylor's Manifest Anxiety Scale (1953), only one, 'I feel anxious about something or someone almost all of the time,' is descriptive of general anxiety. In contrast, 18 items describe autonomic symptoms. The remaining 31 items describe signs such as an inability to concentrate and easily hurt feelings which, in the current sample, tended to correlate higher with the depression factor.

#### Inter-rater reliability

The intraclass correlation coefficients of inter-rater reliability for the depression and phobic anxiety factors are presented in Table II. They are at least as high as those reported by others for factors combining depression and anxiety.

#### DISCRIMINATIONS AMONG DIAGNOSTIC GROUPS

##### (1) Depressive versus anxiety neurosis

Means for depressive and anxiety neurotics on depression and phobic anxiety are presented in Fig. 1. There was no difference of any practical magnitude on the depression factor ( $t = 0.45$ , n.s.), but a significant difference on the phobic anxiety factor ( $t = 2.87$ ,  $p < 0.01$ ). Anxiety neurotics seem to be distinguished by having greater levels of phobic anxiety than depressive neurotics, and not by having lower levels of depression. The means for both groups on both factors are, however, above the overall mean of 50.

##### (2) Neurotic versus psychotic depression

Figure 2 presents means for neurotic and psychotic depressives. Included among the

psychotic depressives were all patients diagnosed involuntal melancholia; manic depressive, depressed; and reactive depressive psychosis. The  $t$  ratios for both factors were approximately unity, indicating no significant difference on either depression or phobic anxiety. Neurotic and psychotic depressives did, however, differ significantly on some of the factors discussed below.

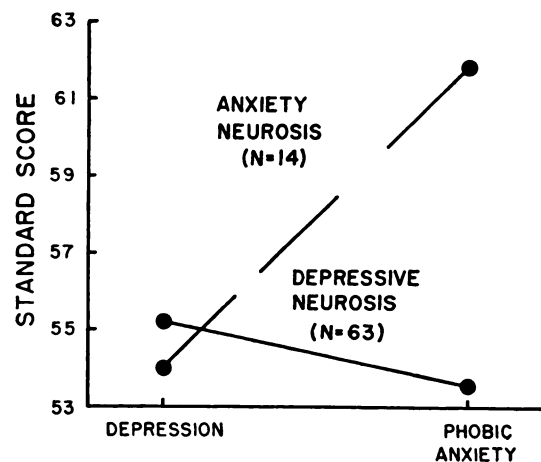


FIG. 1.—Mean standard scores of depressive neurotics and anxiety neurotics on the depression and phobic anxiety factors.

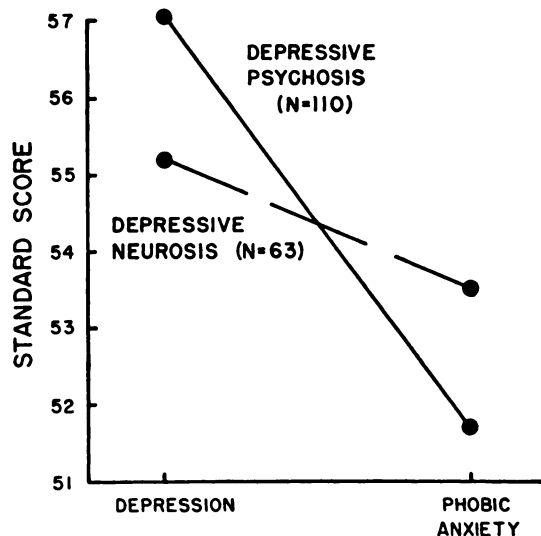


FIG. 2.—Mean standard scores of neurotic depressives and psychotic depressives on the depression and phobic anxiety factors.

TABLE II  
Intraclass correlation coefficients of reliability for the depression and phobic anxiety factors

Factor	Interviewer-observer (N = 37)	Repeat interview (N = 25)	Audiotape (N = 24)
Depression	0.97	0.88	0.93
Phobic anxiety	0.92	0.86	0.91

(3) *Schizo-affective psychosis versus other schizophrenias*

Mean standard scores on the depression and phobic anxiety factors for schizo-affectives and for all other schizophrenics are presented in Fig. 3. The mean difference on the depression factor was statistically significant ( $t = 2.65$ ,  $p < .01$ ), but the difference on the phobic anxiety factor was not ( $t = 0.75$ , n.s.). When the other schizophrenics were subdivided by type of schizophrenia, it was found that the schizo-affectives still had the highest mean on depression, the differences being significant at the .05 level or beyond between the schizo-affectives and all but the hebephrenic schizophrenics. None of the differences on the phobic anxiety factor between the schizo-affectives and the other subtypes of schizophrenia even approached statistical significance.

SEPARATION OF RETARDED SPEECH, RETARDED MOVEMENT AND FLAT AFFECT

In the factor analyses of Lorr *et al.* (1962) and of Spitzer *et al.* (1967), items describing retarded speech, retarded movement and flat affect were combined into single factors, identified as Retardation and Apathy in Lorr's system and as Retardation-Emotional Withdrawal in Spitzer's. In the present analysis,

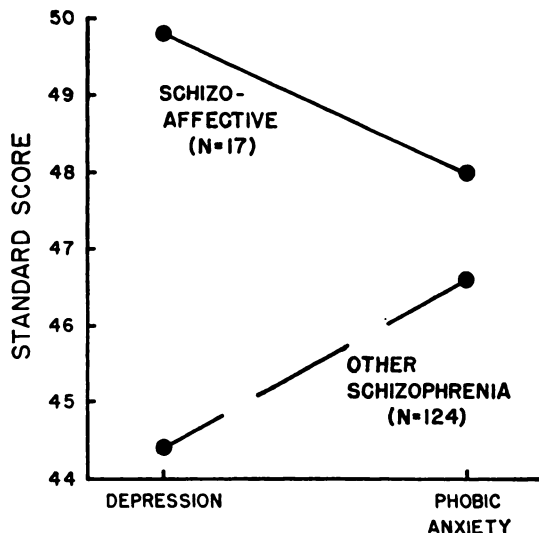


FIG. 3.—Mean standard scores of schizo-affectives and other schizophrenics on the depression and phobic anxiety factors.

retarded speech, retarded movement and flat affect emerged as separate factors. Retarded speech and retarded movement were moderately correlated ( $r = 0.43$ ), as were retarded speech and flat affect ( $r = 0.34$ ). Retarded movement and flat affect, however, were only slightly correlated ( $r = 0.14$ ).

*Retarded speech*

Thirteen items, ten from the PSE and three from the PSS, contributed to the retarded speech factor. Some of the highest loading items were:

- 'Frequently fails to answer,'
- 'Long pauses before replying,'
- 'Almost no or no extra sentences,'
- 'Almost no or no unprompted additional comments,' and
- 'Answers with single words or brief phrases only.'

*Retarded movement*

Five items, four from the PSE and one from the PSS, contributed to the retarded movement factor. These items were:

- 'Very slow to move (unusual for age),'
- 'Marked slowness of movement,'
- 'No arm-swinging,'
- 'Shuffling gait (unusual for age),' and
- 'Slow in all movements.'

*Flat affect*

Ten items, seven from the PSE and three from the PSS, contributed to the flat affect factor. Some of the highest loading items were:

- 'Expressionless face,'
- 'Monotonous voice,'
- 'Facial expression lacks signs of emotion,'
- 'Talks of condition with no signs of emotion,' and
- 'No gestures accompany speech.'

*Inter-rater reliability*

Intraclass correlation coefficients of reliability for the retarded speech, retarded movement and flat affect factors are presented in Table III. The retarded speech and flat affect factors were rated reliably both at a single point in time and over time. The reliability of the retarded movement factor was only moderate, perhaps because it consisted of only five items. The reliabilities of retarded movement and flat affect could not be assessed from audiotapes.



TABLE III  
Intraclass correlation coefficients of reliability for the retarded speech, retarded movement and flat affect factors

Factor	Interviewer-observer (N = 37)	Repeat interview (N = 25)	Audiotape (N = 24)
Retarded speech	0.95	0.83	0.81
Retarded movement	0.64	0.50	—
Flat affect	0.72	0.82	—

#### DISCRIMINATIONS AMONG DIAGNOSTIC GROUPS

##### (1) Neurotic versus psychotic depression

Mean standard scores for neurotic and psychotic depressives are presented in Fig. 4. The differences were significant for retarded speech ( $t = 2.28$ ,  $p < 0.05$ ) and for retarded movement ( $t = 2.73$ ,  $p < 0.01$ ), but not for flat affect ( $t = 1.05$ , n.s.).

##### (2) Schizo-affective psychosis versus other schizophrenias

Mean standard scores for schizo-affectives

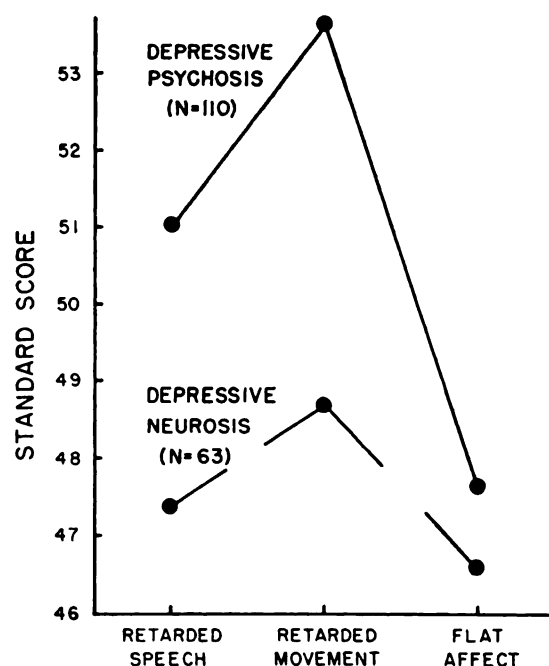


FIG. 4.—Mean standard scores of neurotic depressives and psychotic depressives on the retarded speech, retarded movement and flat affect factors.

and other schizophrenics are presented in Fig. 5. The difference was significant for flat affect ( $t = 2.81$ ,  $p < 0.01$ ) but not for retarded speech ( $t = 1.37$ , n.s.) or for retarded movement ( $t = 0.73$ , n.s.).

##### (3) Depression versus schizophrenia

Mean standard scores for all depressives (including neurotic and psychotic depressives) and all schizophrenias (including schizo-affectives) are presented in Fig. 6. The difference is highly significant for flat affect ( $t = 8.03$ ,  $p < 0.001$ ) but not for retarded speech ( $t = 1.88$ , n.s.) or for retarded movement ( $t = 1.63$ , n.s.).

#### SEPARATION OF OBSERVED RESTLESSNESS AND MANIA

A factor describing restlessness exhibited by the patient during the interview emerged separate from one describing manic behaviour. This separation stands in contrast to the combination of these dimensions into the excitement factor of Lorr *et al.* (1962), and to their combination into the agitation-excitement factor of Spitzer *et al.* (1967). In the current sample, observed restlessness and mania correlated only .15.

##### Observed restlessness

Five items constituted the observed restlessness factor, four from the PSE and one from

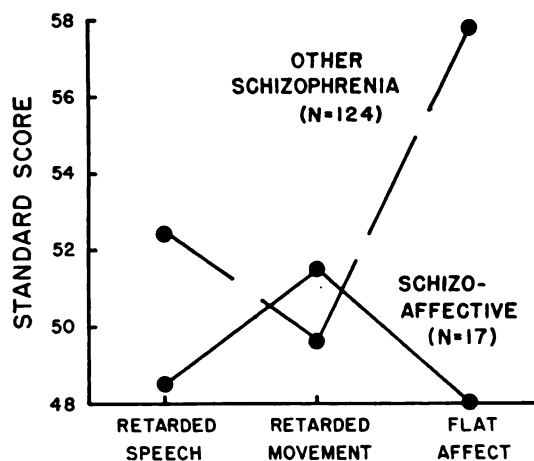


FIG. 5.—Mean standard scores of schizo-affectives and other schizophrenics on the retarded speech, retarded movement and flat affect factors.

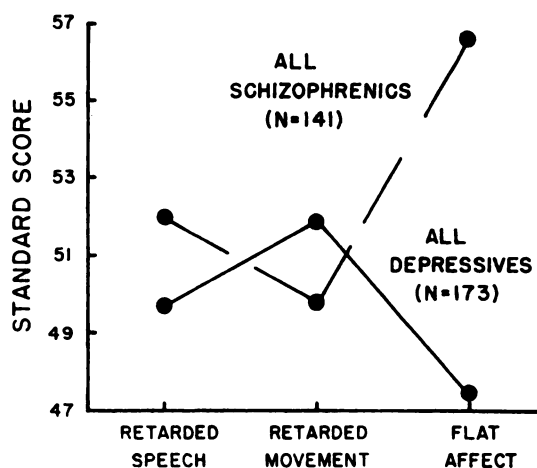


FIG. 6.—Mean standard scores of all depressives and all schizophrenics on the retarded speech, retarded movement and flat affect factors.

the PSS. The kinds of behaviours described in these items are marked agitation, restlessness, fidgeting, pacing, squirming in seat, and getting up and moving about.

*Mania*

Eleven items contributed to the mania factor, eight from the PSE and three from the PSS. The items correlating highest with the total factor score were:

- 'Pressure of speech,'
- 'Very rapid speech,'
- 'Elated, euphoric, perhaps changing to irritability or depression,'
- 'Flight of ideas,' and
- 'More ideas than other people have, or than he can manage.'

*Inter-rater reliability*

Intraclass correlation coefficients for the observed restlessness and mania factors are presented in Table IV. Both are fairly reliably rated at one point in time, but neither remains stable over time. The observed restlessness factor could not be rated from an audiotape.

DISCRIMINATIONS AMONG DIAGNOSTIC GROUPS

(1) *Neurotic versus psychotic depression*

Mean standard scores for neurotic and psychotic depressives are presented in Fig. 7.

TABLE IV  
Intraclass correlation coefficients of reliability for the observed restlessness and mania factors

Factor	Interviewer-observer (N = 37)	Repeat interview (N = 25)	Audiotape (N = 24)
Observed restlessness	0.82	-0.07	—
Mania	0.68	0.0	0.69

There was no essential difference on the mania factor ( $t = 1.17$ , n.s.), but a significant difference on observed restlessness ( $t = 3.26$ ,  $p < 0.01$ ). Both psychotic and neurotic depressives tended to exhibit few if any signs of mania, but the psychotic depressives tended to exhibit more restlessness during the interview than the neurotic depressives.

(2) *Manic-depressive, manic versus psychotic depression*

Mean standard scores for manic-depressive, manics and psychotic depressives are presented in Fig. 8. There was virtually no difference on observed restlessness ( $t = 0.30$ , n.s.), but a strongly significant difference on mania

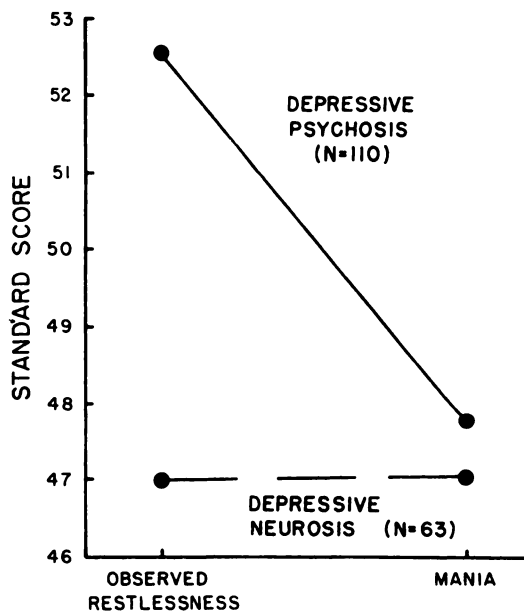


FIG. 7.—Mean standard scores of neurotic depressives and psychotic depressives on the observed restlessness and mania factors.

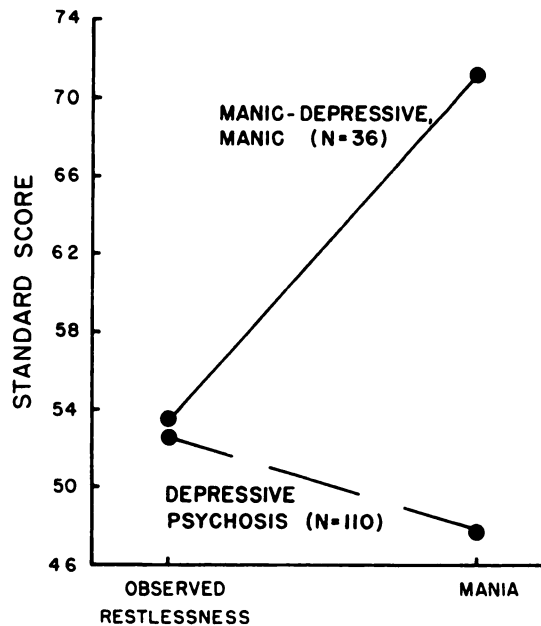


FIG. 8.—Mean standard scores of manic-depressive, manics and psychotic depressives on the observed restlessness and mania factors.

( $t = 11.32, p < 0.001$ ). Both of these kinds of patients tended to exhibit moderate degrees of restlessness, but the manics exhibited a great degree of manic behaviour, whereas the psychotic depressives tended to exhibit little.

#### DISCUSSION AND CONCLUSIONS

The success in factorially separating phobic anxiety from depression, flat affect from retarded speech and retarded movement, and observed restlessness from mania cannot be attributed to the method of analysis. Varimax rotation, the factor analytic method used in the current study, has been employed in many other factorial analyses of psychopathology. Rather, the success seems due to the inclusion in the Present State Examination, which formed the major portion of the interview schedule, of items describing various aspects of dimensions deemed important for a portrait of psychopathology.

Thus, these results vindicate mathematically some of the clinical conventions and traditions upon which the PSE was based (Wing *et al.*, 1967). Many more than 25 symptom groups were built into the interview schedule, but a

number of diagnostically important symptoms, such as some of the 'first-rank' symptoms of schizophrenia (Schneider, 1959), and depressive hallucinations, neither contributed to any of the 25 factors nor combined to form factors of their own. The reason might simply be that they were not common enough in the unselected series of patients studied to reach high levels of correlation with other symptoms.

The mere isolation of a factor is not sufficient for its consideration as a *bona fide* parameter. It seems to be a mathematical property of factor analysis that the inclusion among the variables to be analysed of a group of interrelated items almost forces these items, regardless of what they describe, to emerge as a separate factor. It is therefore necessary to test the validity of each factor before declaring it to measure a distinct dimension. All the factors listed in Table I have clinical face validity in that they are recognizable as conventionally accepted groups or types of symptoms. The diagnostic comparisons made above represent the beginnings of a more rigorous empirical validation. Some of the results, however, indicate the need for further effort.

The items contributing to the depression factor are sufficiently similar to the behaviours which constitute the depression scales of Hamilton (1960), Beck *et al.* (1961) and others for it to be considered a valid measure of depression. The same cannot yet be said of the phobic anxiety factor, for there are not available a sufficient number of validated measures of anxiety against which it may be contrasted. The problem of the relative contributions to phobic anxiety of situational anxiety and of specific autonomic symptoms can only be resolved by studies attempting a more extensive survey of the kinds of situations which give rise to anxiety, and of the physical ways in which anxiety may be manifested. Such studies may also lead to items descriptive of general anxiety correlating higher with an anxiety than with a depression factor rather than, as found above, correlating about equally with both.

The flat affect factor seems to merit status as a dimension separate from retarded speech and retarded movement. The issue is not as



clear for the two retardation factors, however. When one of the two significantly distinguished between two groups, so usually did the other, both in the same direction and to about the same extent. Conversely, when one of the two failed to distinguish significantly between two groups, so did the other usually fail. These findings, together with the relatively high correlation between the retarded speech and retarded movement factors, imply that they might better be combined into a single speech and motor retardation factor. Only further studies, with motor retardation measured with more items than the five found here, will settle this issue.

Observed restlessness and mania seem, in view of the small correlation between them, and in view of their different discriminabilities among diagnostic groups, to merit consideration as separate dimensions. The reliability of the observed restlessness factor is good, but that of the mania factor needs some improvement. Whether the improvement should be by the addition of items describing other aspects of manic behaviour, or by the training of raters to be especially sensitive to mania, can only be determined by further research.

The finding that behaviours reported by others to comprise single factors might better be viewed as separate factors has serious implications for the measurement of psychopathology. As in nuclear physics, where the elementary particles are no longer the proton, neutron and electron, but include the positron, neutrino,  $\mu$ - and  $\pi$ -mesons, etc., so in psychopathology have more exhaustive surveys of problems and complaints indicated that the dimensions of psychopathology are more numerous than has been imagined. Any closure on research into the dimensions of psychopathology which characterize mental patients would clearly be premature.

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